Kansas Department of Health and Environment
Division of Environment

Kansas Harmful Algal Bloom Response Program

NMC - 2019

Kansas Harmful Algal Bloom Response Program

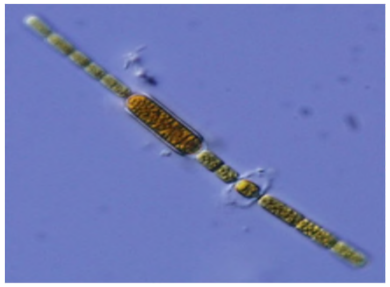
Kansas HAB Program

- Started in 2010
- Complaint-based response program
- Advisories based on visual, cell counts and/or microcystin concentrations in public lakes only
- Focus on recreational waterbodies
  - Several serve as PWS
- 2018: 32 lakes affected
- Program and policies are in constant evolution

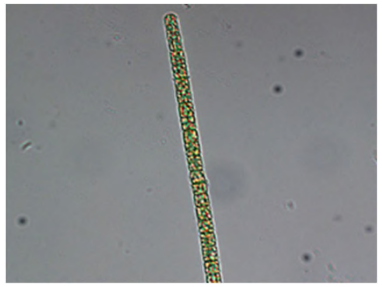
Kansas Harmful Algal Bloom Response Program

Cyanobacteria of primary concern in Kansas

Microcystis



Aphanizomenon *



Cylindrospermopsis *

Dolichospermum (= *Anabaena*) *

* many can fix atmospheric nitrogen

Kansas HAB Response Plan

- Responses Limited to blooms reported in “Public Waters”
- Public Waters are:
  - Reservoirs, community lakes, state fishing lakes and/or are waters managed or owned by federal, state, county or municipal authorities, or
  - Privately owned lakes that serve as public drinking water supplies or that are open to the general public for primary or secondary contact recreation

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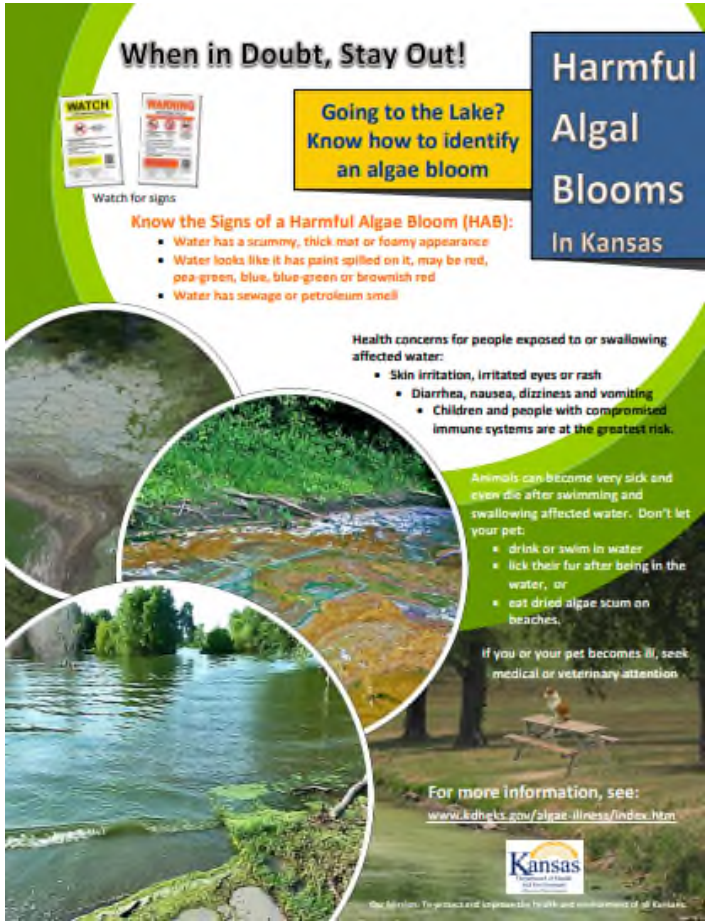
Kansas HAB Response Process

- Suspected HAB reported to KDHE
  - Web-based reporting system and hotline
- KDHE contacts lake manager for validation
- Sample collection is coordinated (PWS if relevant)
- Samples are received and analyzed
- Public Health threat assessed
- Advisories issued and waterbodies posted
- Repeat if necessary (weekly cycle)
- Recreation season April 1 – October 31



Kansas HAB Response Process - Validation

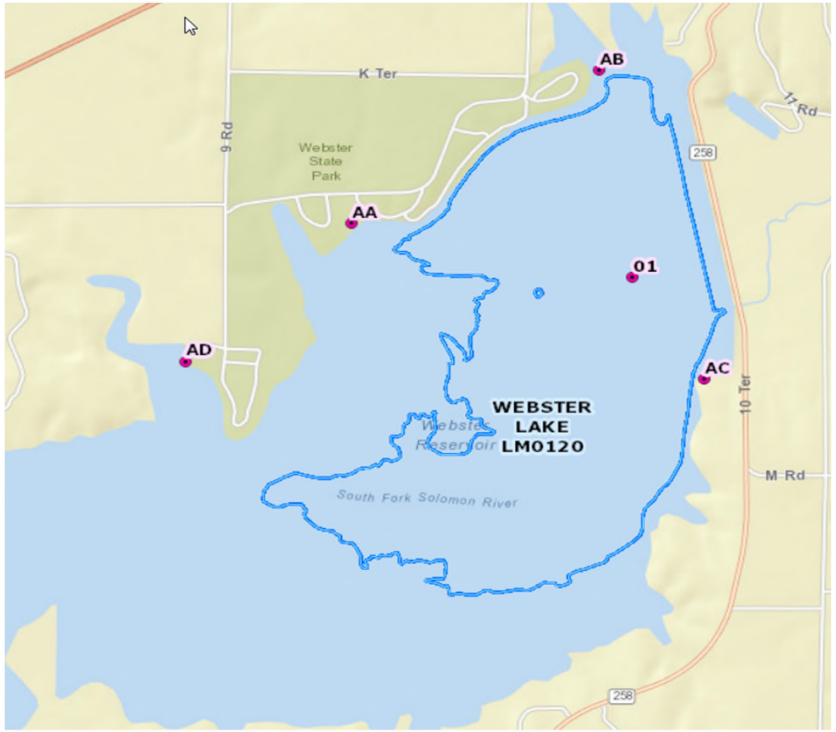
- Validation by Lake Managers
- Visual – Photos
- The Jar Test
  - Clear Jar ¾ full
  - refrigerated overnight

No Blue-Green Algae Present

Blue-Green Algae Present

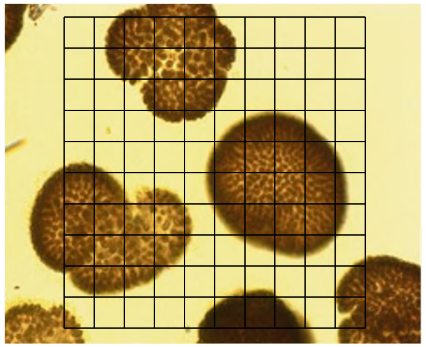
Kansas HAB Response – Sample Selection

- Samples Collected by District staff on Mondays and Tuesdays
- Sample sites pre-selected at publically accessible locations identified as major points of public access
  - Swim beaches
  - Marinas
  - Boat Ramps/docks
  - Public Water Supply Intakes



Kansas HAB Response –Sample Analysis

- Recreational Samples analyzed in-house on Wednesdays
  - ELISA - microcystin recreational samples (all)
  - Algae ID and cell counts
    - Limited samples, often one per lake
- Public Water Supply Samples sent to Kansas Health and Environment Laboratory
  - Abraxis



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KDHE Thresholds

Watch

- 4 µg/L microcystin OR
- Cyano cell count of 80K/mL OR Visual confirmation

Warning

- 20 µg/L microcystin OR
- Cyano cell count of 250K/mL OR significant surface scum

Closure

- 2000 µg/L microcystin OR
- Cyano cell count of 10M/mL

Recreation

Modeled after NWS tornado alerts

Public Water Supply

Follow WHO & USEPA Guidelines

- Microcystin & Cylindrospermopsin
- A looming issue for PWS source water
- Treatment with activated carbon has been effective
- Cyanotoxins not prevalent in river systems under most conditions

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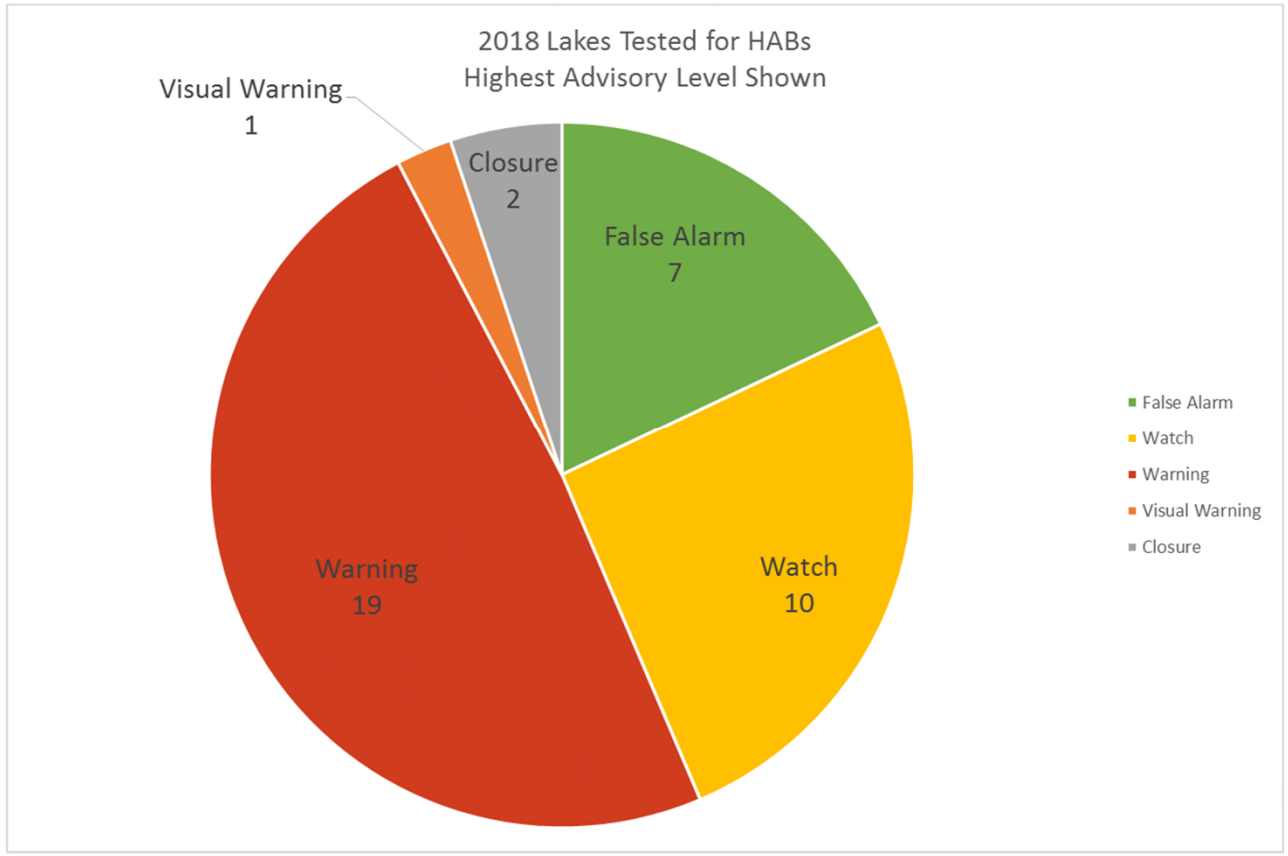
Kansas HAB Response – Issuing Advisories

- Stakeholder Conference Call held on Thursdays releasing data and issuing weekly advisories
- Determine next week sample schedule
- Press Releases Issued
- Advisories on website and HAB hotline
- Waterbodies posted by Lake Managers
- Repeat if necessary (weekly cycle)

Kansas Harmful Algal Bloom Response Program

Monitoring 2018



- 32 Lake Advisories
- 180 Sampling events
  - 299 Toxin Analyses
  - 189 Cell Counts

Waterbody and ID	Sampler	5/7 5/10	5/14 5/17	5/21 5/24	5/29 6/1	6/4 6/7	6/11 6/14	6/18 6/21	6/25 6/28	7/2 7/5	7/9 7/12	7/16 7/19	7/23 7/26	7/30 8/2	8/6 8/9	8/13 8/16	8/20 8/23	8/27 8/30	9/4 9/6	9/10 9/13	9/17 9/20	9/24 9/27	10/1 10/4	10/8 10/12	10/15 10/19	10/22 10/25	10/29 11/1
Anthony City Lake (75%) LM0488	SC								L																		
Atchison County Park Lake (75%) LM0606	NE									W	W	W	W	W	W	W	W	W	W	W	W	W	W	L			
Atchison Co SFL (25%) LM0126	NE																				Watch	Watch	Watch	L			
Atwood Township Lake (75%) LM0712	NW																W	W	W	W	L						
Big Hill Lake (25%) LM0310	SE	L																									
Carbondale West Lake (75%) LM0608	NE								W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	L	
Central Park Lake (75%) LM0609	Central			Watch	Watch	W	L			W	W	Watch	Watch	L		Watch	Watch	W	W	W	W	W	W	L			
Clarion Woods Lake (75%) LM0759	NE								W	W	W	L															
Colwich City Lake (75%) LM0175	SC				Watch	Watch	Watch	Watch	L																		
Cottonwood River, South of Emporia	SE															Watch	Watch	Watch	Watch	L							
Council Grove City Lake (25%) (PWS) LM0430	NC																			Watch	L						
Frazier Lake LM0602	SW											W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
Hodgeman County SFL (75%) LM0742	SW												W	W	W	W	Watch	Watch	Watch	W	W	W	W	W	Watch	L	
Jerry Ivey Pond (75%) LM0760	NC										W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	L
Kirwin Lake (25%) LM0110	NW							L																			
Lake Afton (25%) LM0492	SC										W	W	W	W	W	W	W	W	W	W	W	W	W	W	L		
Lake Scott State Park (75%) LM0112	SW														W	W	W	W	W	Watch	Watch	W	W	L			
Lake Wabaunsee (25%) (PWS) LM0420	NE											W	W	W	W	Watch	Watch	W	Watch	W	W	W	L				
Lakewood Park Lake (75%) LM0698	NC														C	C	W	W	W	W	W	W	W	Watch	Watch	L	
Linn Valley Lake (PWS) LM0443	SE																Watch	L									
Marais des Cygnes Wildlife Area LM0532	SE												W	W	W	W	W	W	W	W	W	W	W	W	W	L	L
Marion County Lake (25%) LM0121	NC						L																				
Mary's Lake (75%) LM0614	NE											Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	L		
Melvern Lake (25%) (PWS) LM0270	NE																Watch	Watch	Watch	Watch	Watch	Watch	L				
Melvern Outlet Pond (25%) (PWS) LM0271	NE									W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	L	
Melvern Outlet Swim Pond (25%) LM0272	NE									W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	L		
Overbrook City Lake (75%) LM0205	NE												Watch	Watch	Watch	W	W	W	W	W	W	Watch	Watch	L			
Overbrook City Kids Pond LM0763	NE																					Watch	Watch	L			
Perry Lake (25%) LM0290 Zone A	NE												L	L	Watch	Watch	Watch	L									
Perry Lake (25%) LM0290 Zone B	NE												W	W	Watch	Watch	Watch	L									
Perry Lake (25%) LM0290 Zone C	NE												L	L													
Perry Lake (25%) LM0290 Zone D	NE												L	L													
Pomona Lake (25%) (PWS) LM0280	NE																Watch	Watch	Watch	Watch	Watch	Watch	Watch	Watch	L		
Rock Garden Pond LM0761	Central												Watch	Watch	Watch	Watch	Watch	Watch	W	W	W	W	W	W	W	L	
Rooks Co. State Fishing Lake (75%) LM119	NW										W	W	W	L													
Sebelius (Norton) Lake (75%) (PWS) LM0100	NW						W	W	L																		
South Lake (75%) LM0675	NE											W	W	W	W	W	W	W	W	W	W	W	W	W	W	Watch	Watch
Tomahawk Park Lakes LM0417	NE																		Watch	Watch	Watch	Watch	Watch	Watch	L		
Webster Lake (75%) LM0120	NW							Wc	Wc	W	W	W	W	W	W	C	C	W	W	W	W	W	W	Watch	Watch	L	
West Campus Pond, KU	NE																						L				

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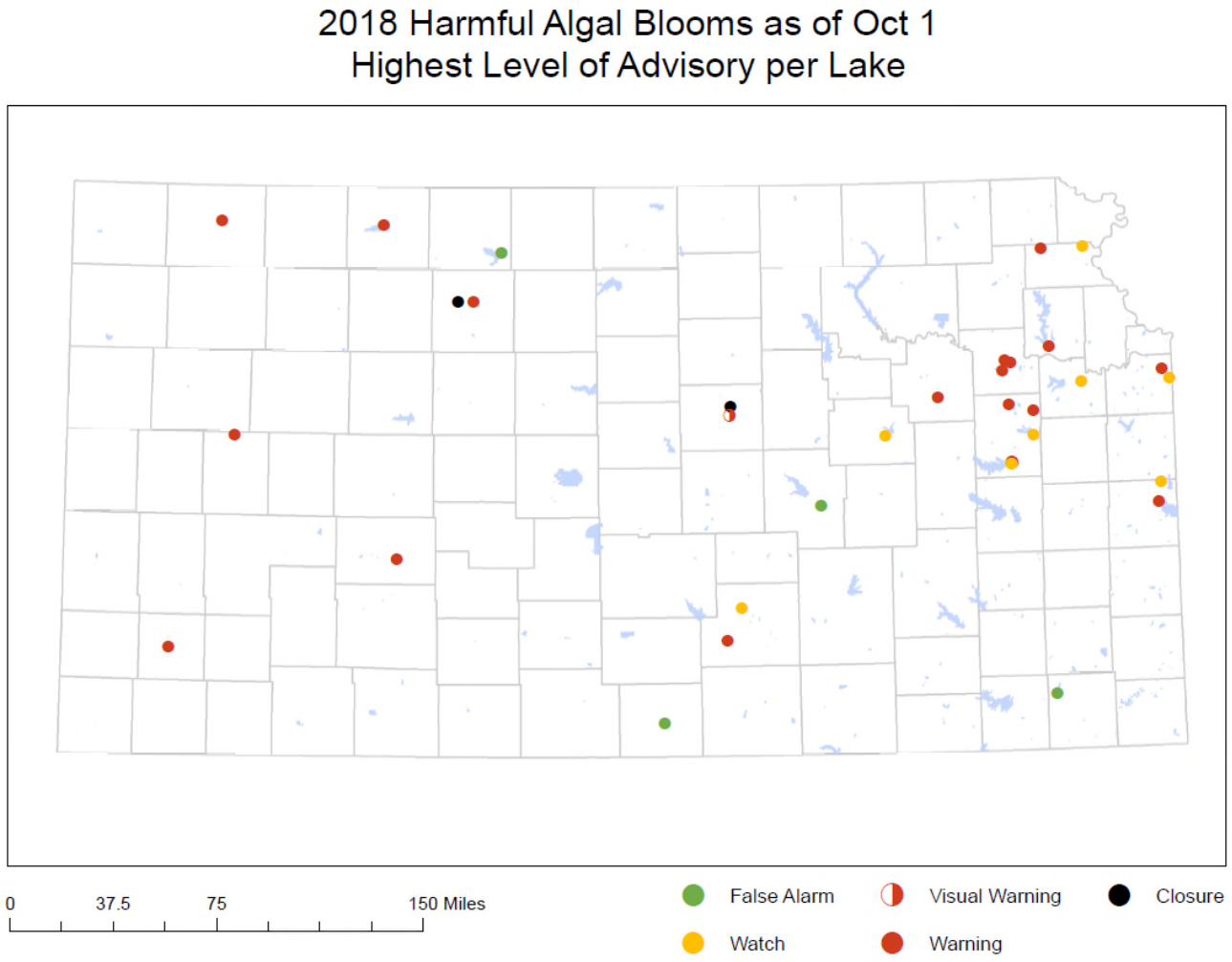
Monitoring 2018



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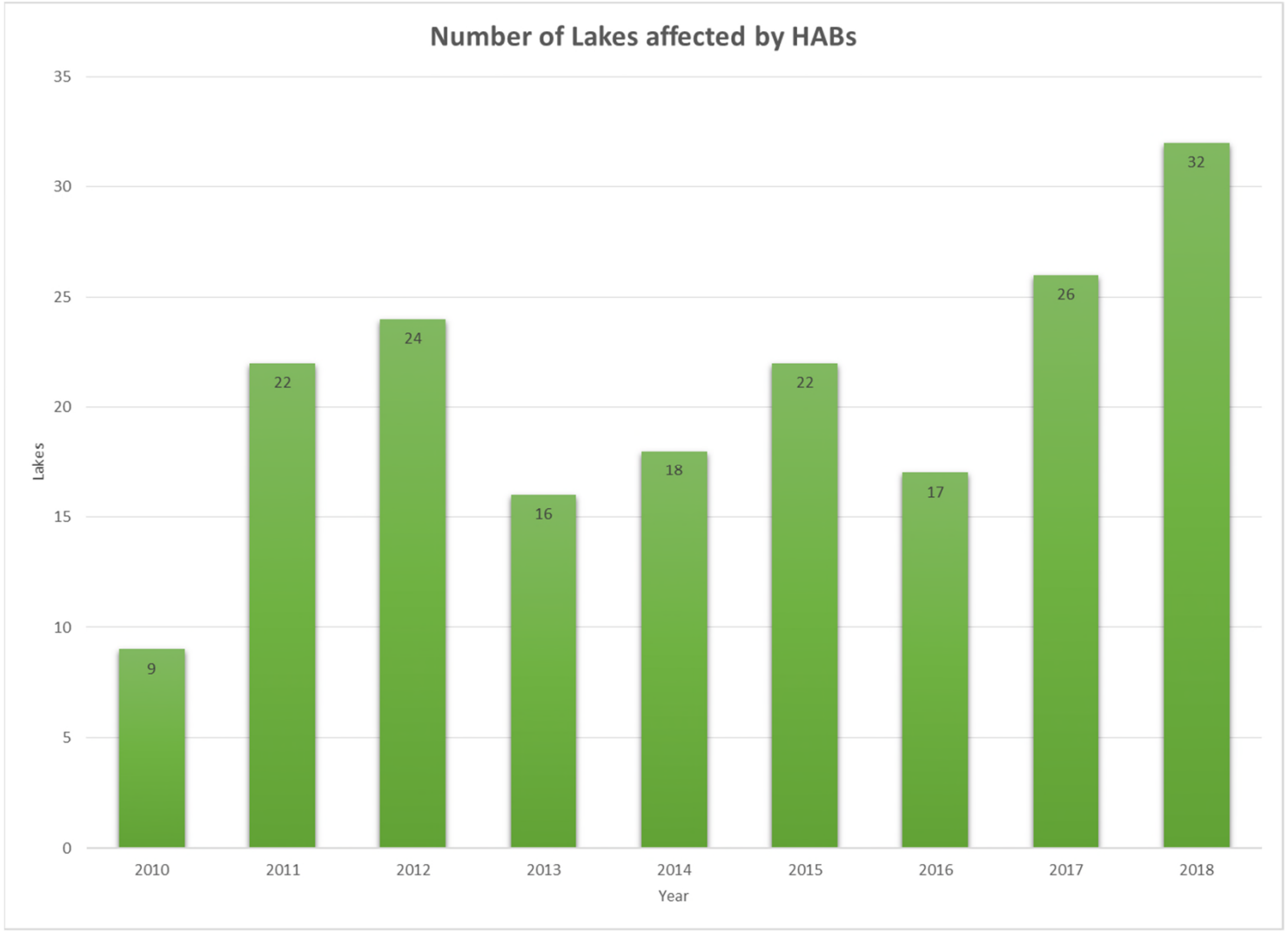
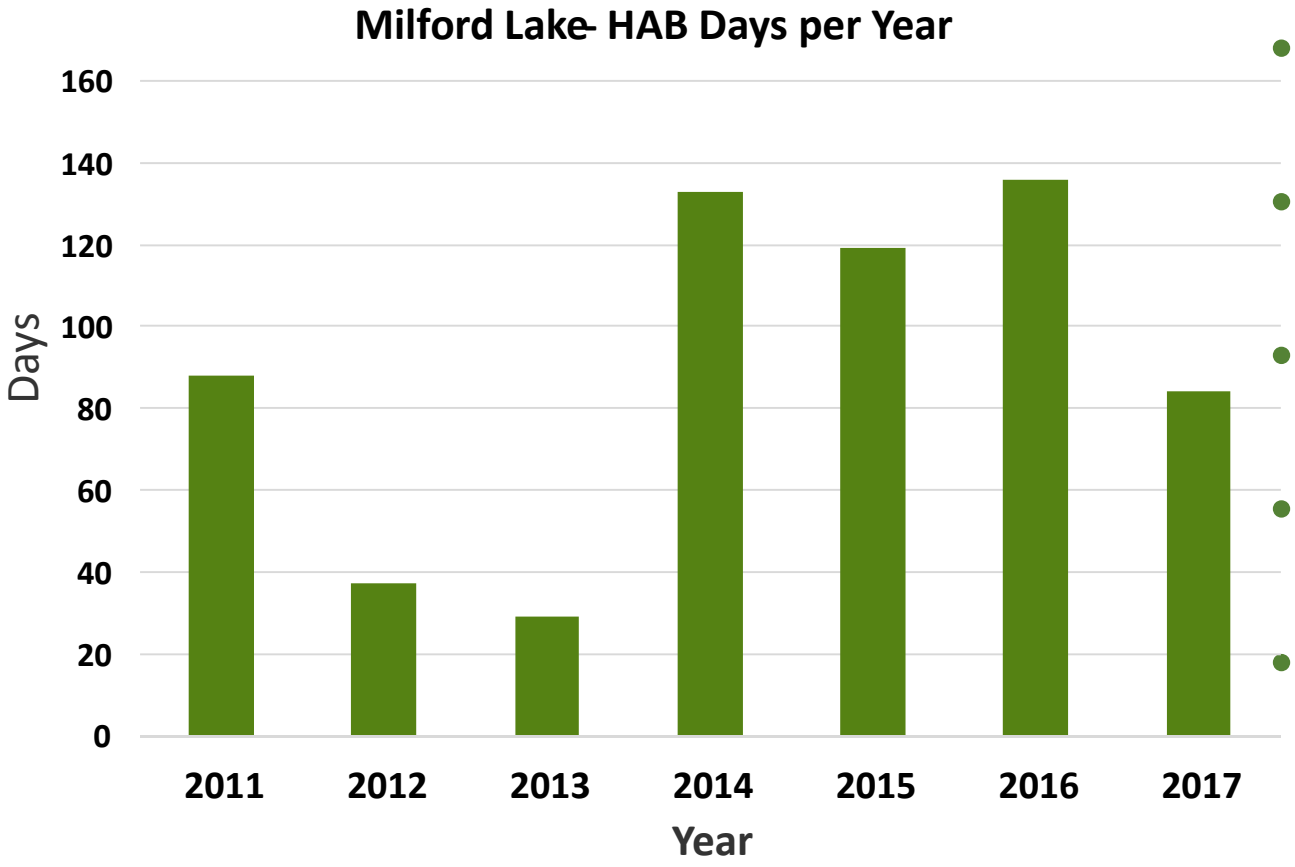


Kansas Harmful Algal Bloom Response Program

Which Lakes will Bloom?



- Story of 2018 was which lakes didn't bloom
- *Spring Inflows – major runoff events are a big deal*
- *Did internal loading fuel blooms during drought? – maybe / maybe not*
- 88 different lakes with HABs since 2010
- 18 first time blooms in 2018

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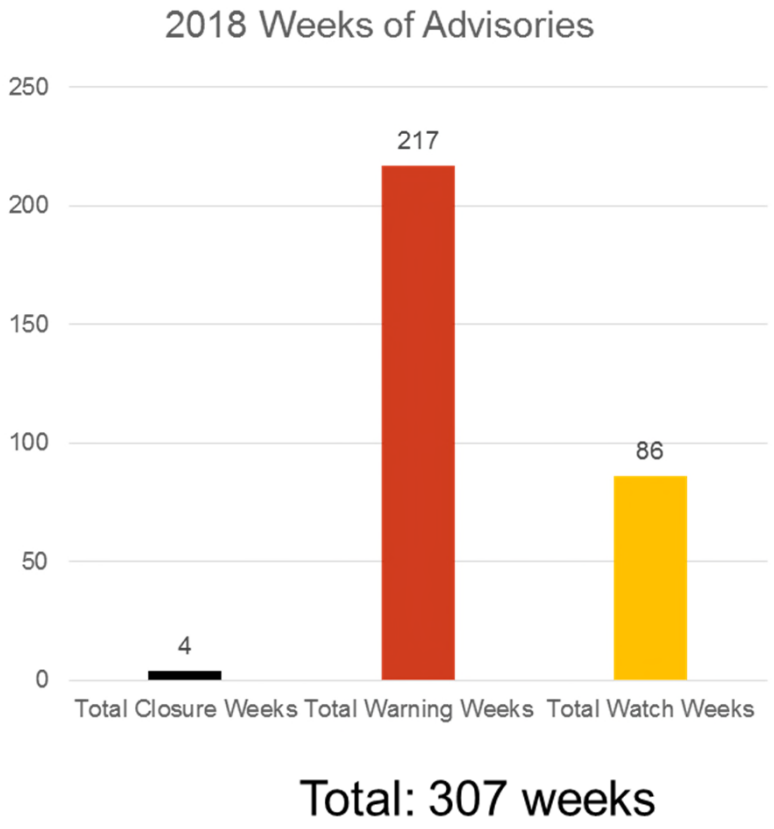
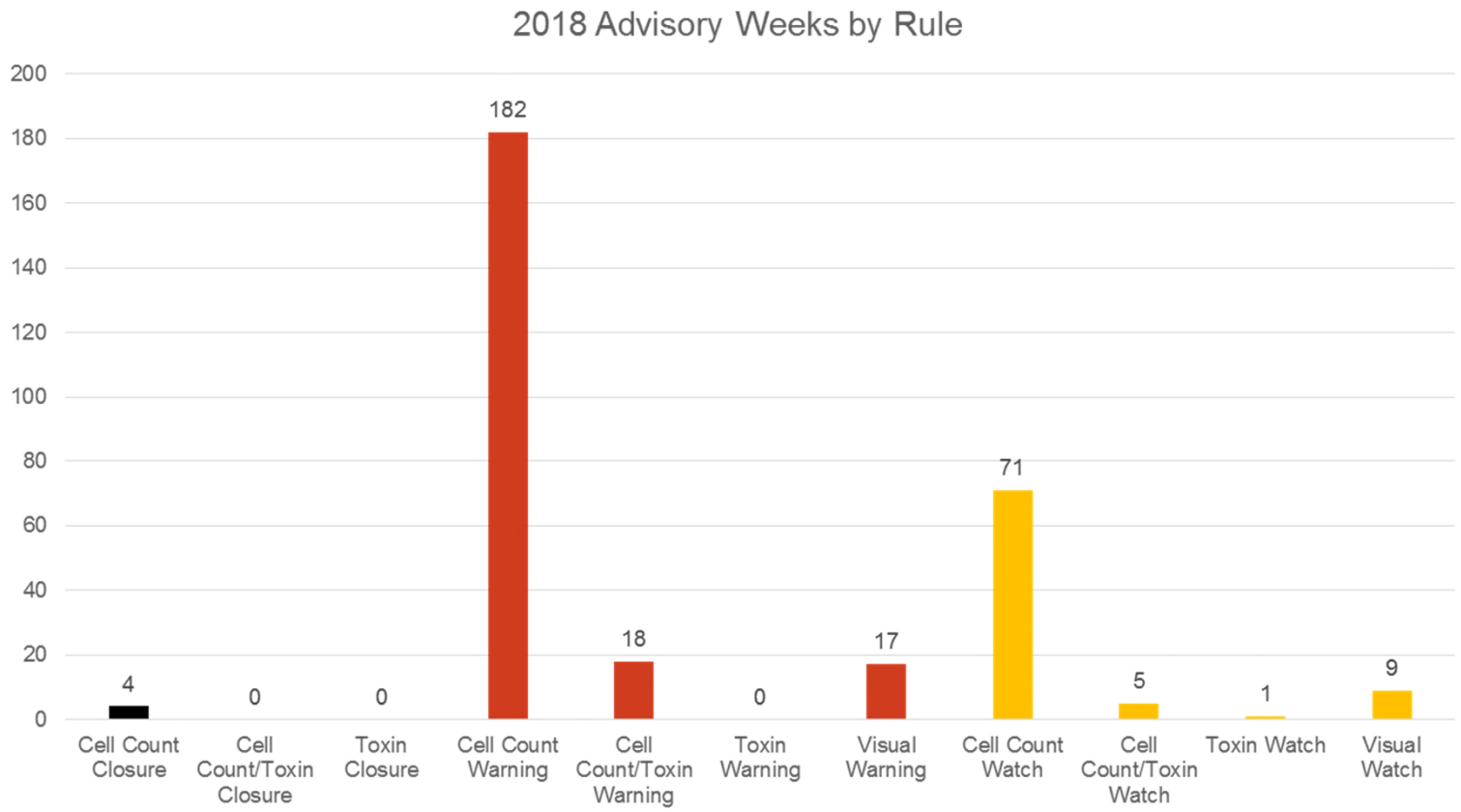
Why are some blooms toxic?





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Why are some blooms toxic?

Year	> CellCount/Toxin Threshold	> Cell Count only	> Toxin only	% of Advisories over Toxin Threshold
2015	39	59	1	40%
2016	24	72	3	27%
2017	11	125	0	8%
2018	10	129	0	7%

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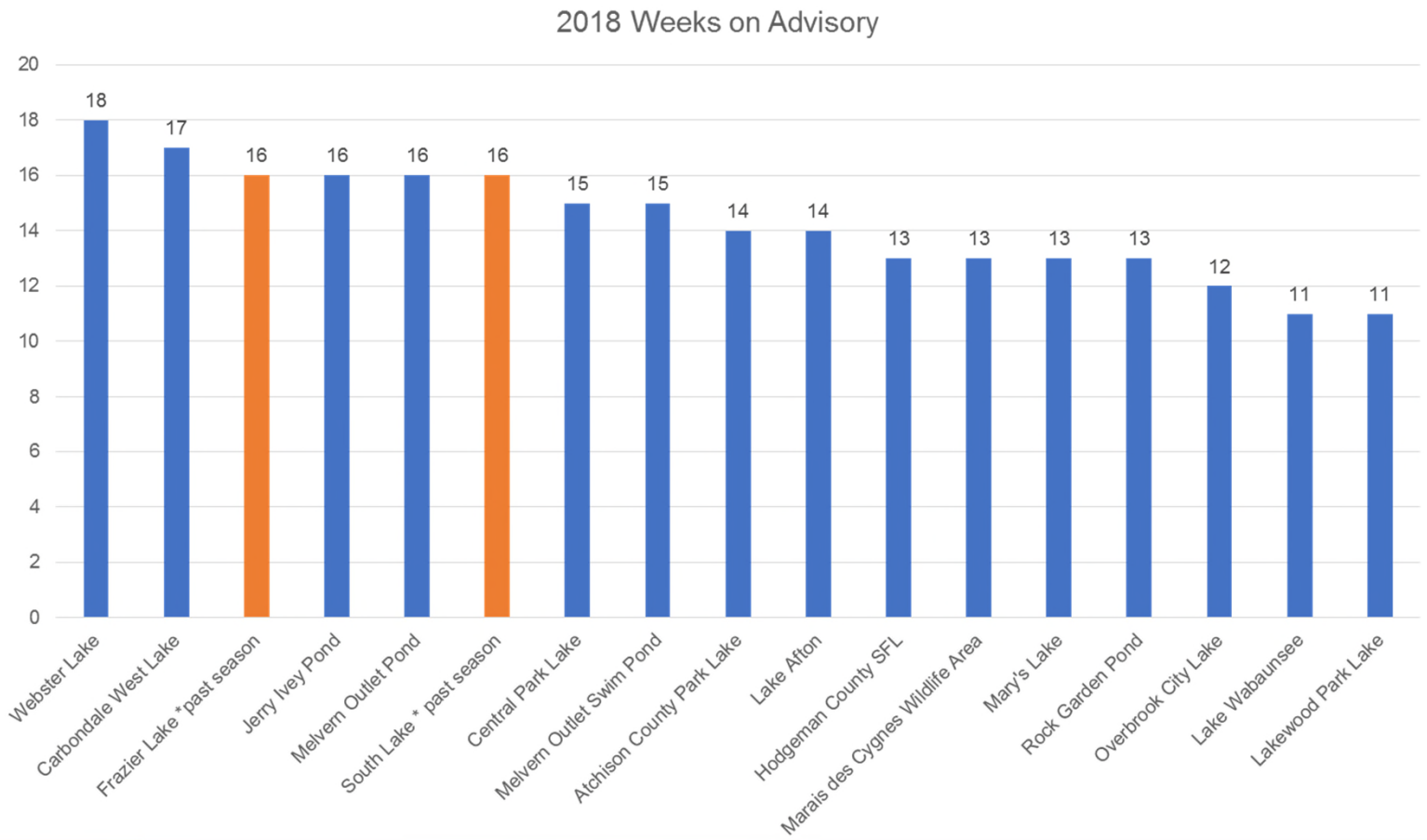
Are bloom durations unpredictable?



Year	Average	Median
2010	8	10
2011	8	7
2012	9	8
2013	8	6
2014	10	7
2015	8	8
2016	9	8
2017	8	10
2018	9	11

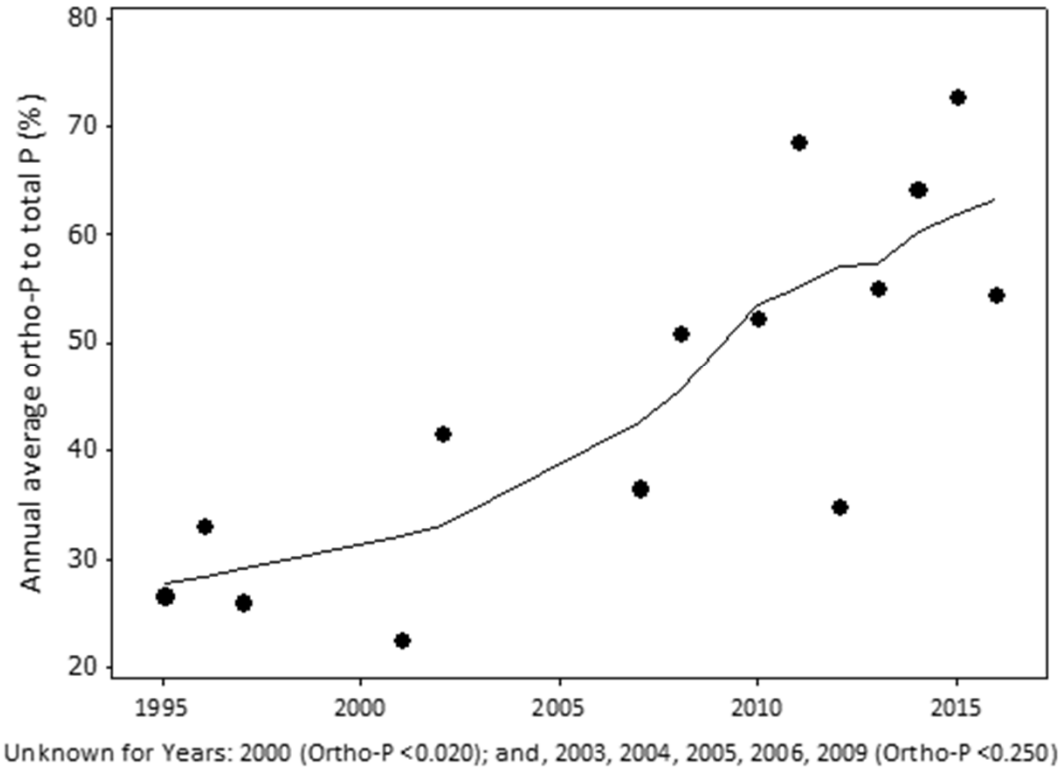
HAB weeks on Advisory

Key Cause: Watershed Phosphorus (form)

Soluble reactive phosphorus increasing

- Changes in agricultural practices that affect soil structure
- New fertilizer formulations and application methods
- Tile drains

(H. Jarvie et al., 2017)

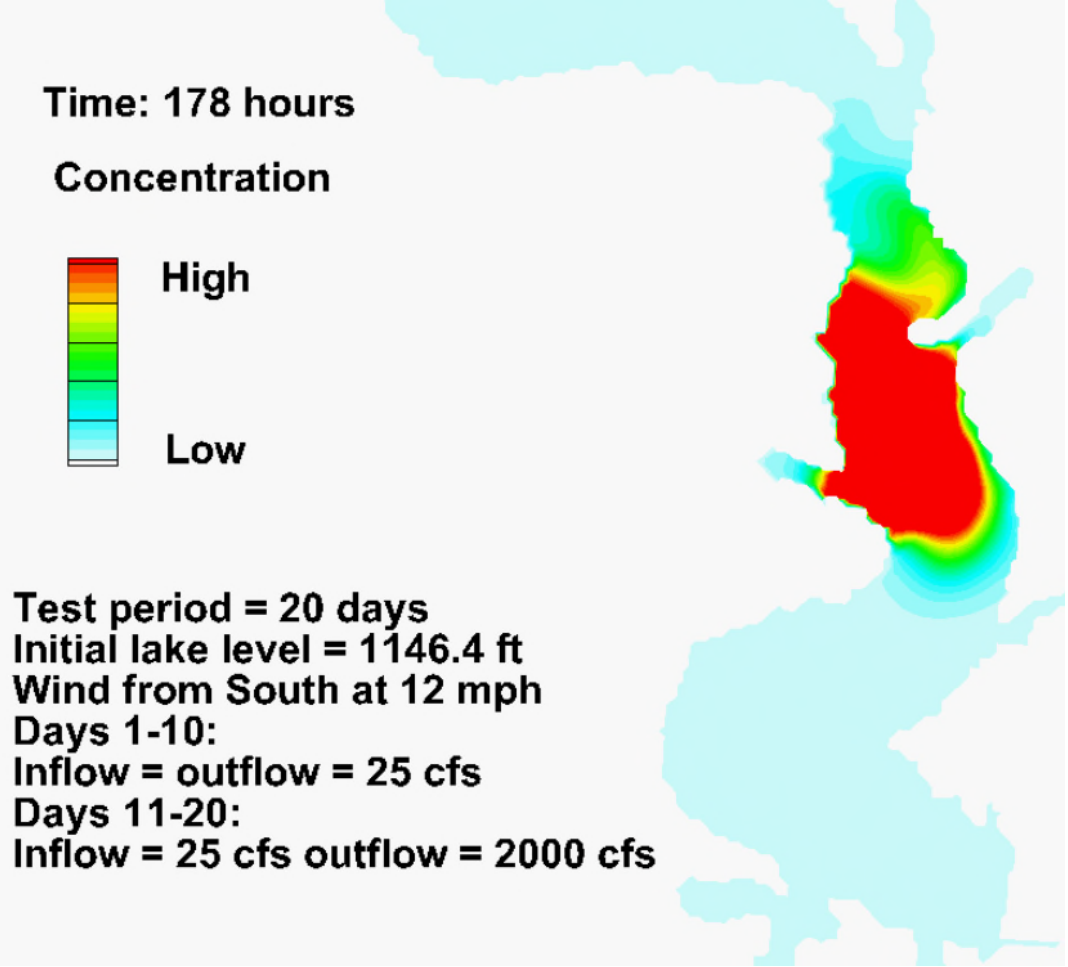


Unknown for Years: 2000 (Ortho-P <0.020); and, 2003, 2004, 2005, 2006, 2009 (Ortho-P <0.250)

Kansas Harmful Algal Bloom Response Program

Kansas Program Initiatives

- KU: Wind and HAB transport modeling
- USGS monitoring
- Rough Fish Removal
- In-Lake Mitigation Pilots
- Recent Drawdowns
- Nutrient Reduction
  - Nonpoint Source Watershed projects
  - Nutrient impairments and TMDLs
- HAB workgroups
- Annual HAB meeting



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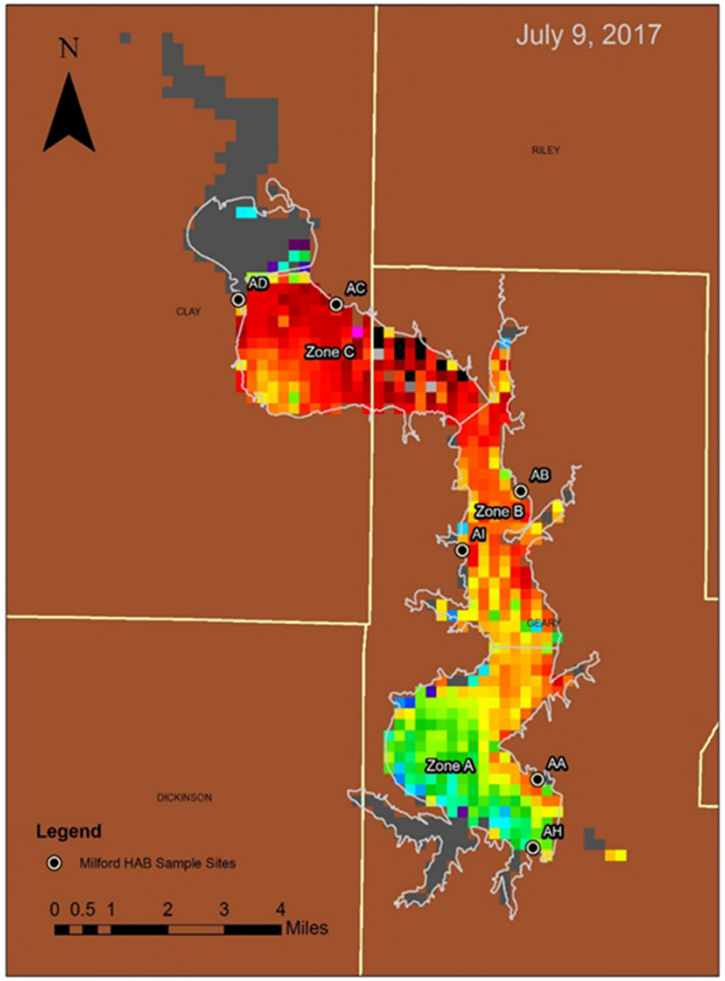
Kansas Program Initiatives

- Satellite Imagery beta monitoring
- PWS Voluntary Sampling - 2019
- Flowcam / Cell Count study w/R7
- Coordination
  - US Army Corps of Engineers
  - KS Wildlife, Parks and Tourism
  - Division of Health – Epidemiology
  - KSU Vet Diagnostic Laboratory
  - EPA
  - KS Water Office
  - Kansas Biological Survey



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Kansas Program Initiatives

- Funding for Pilot work approved
  - Milford and Marion
- Goal to delay and reduce the frequency and duration of bloom events
  - Take advantage of existing efforts with drawdown
- Challenges
  - Scale
  - Weather and resulting lake levels

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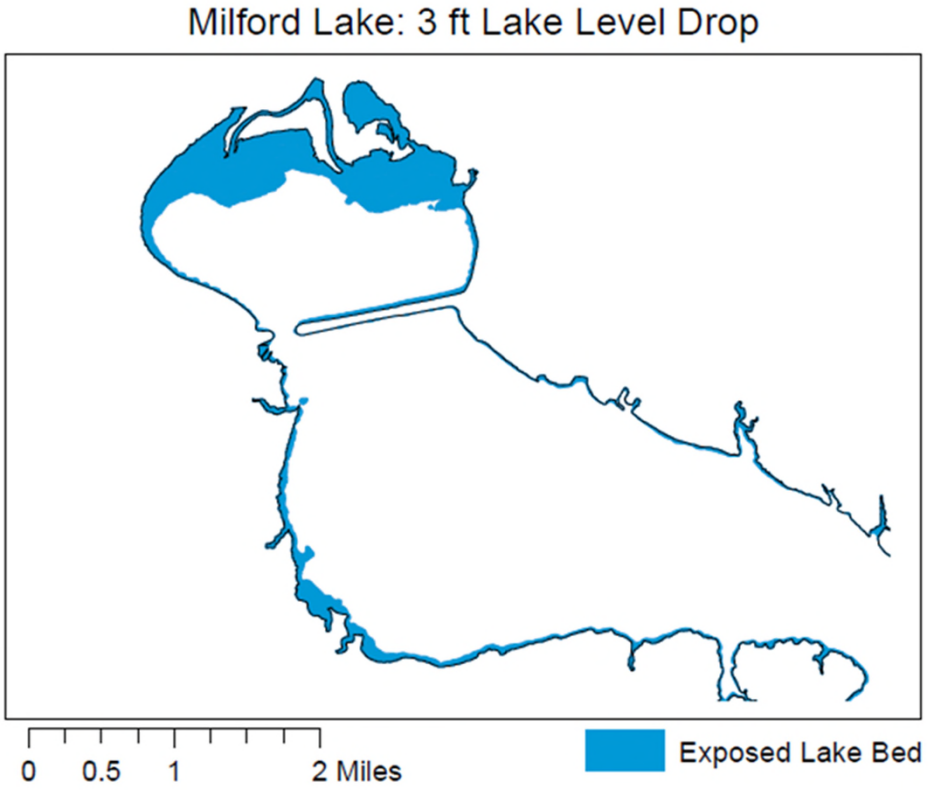
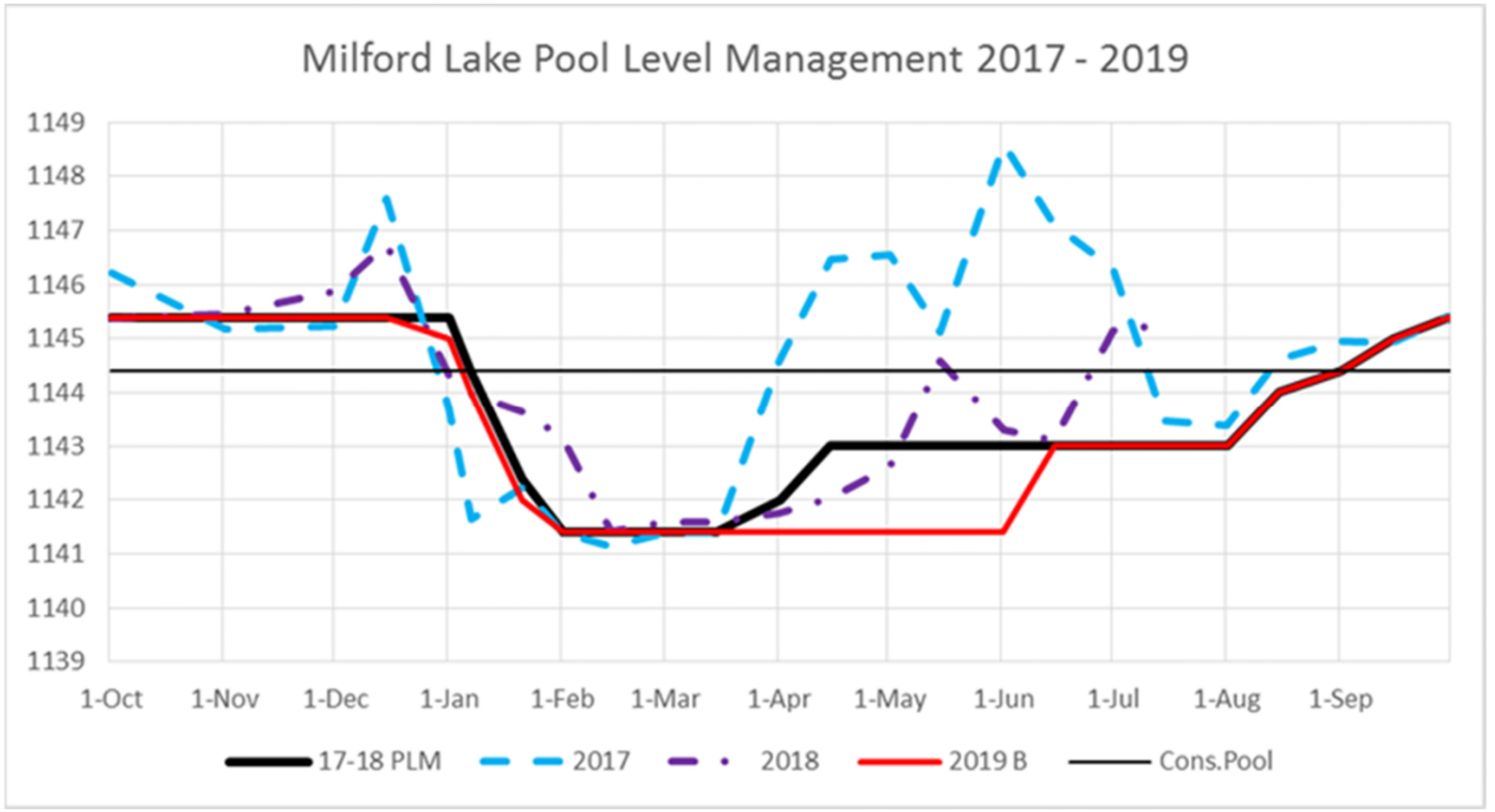
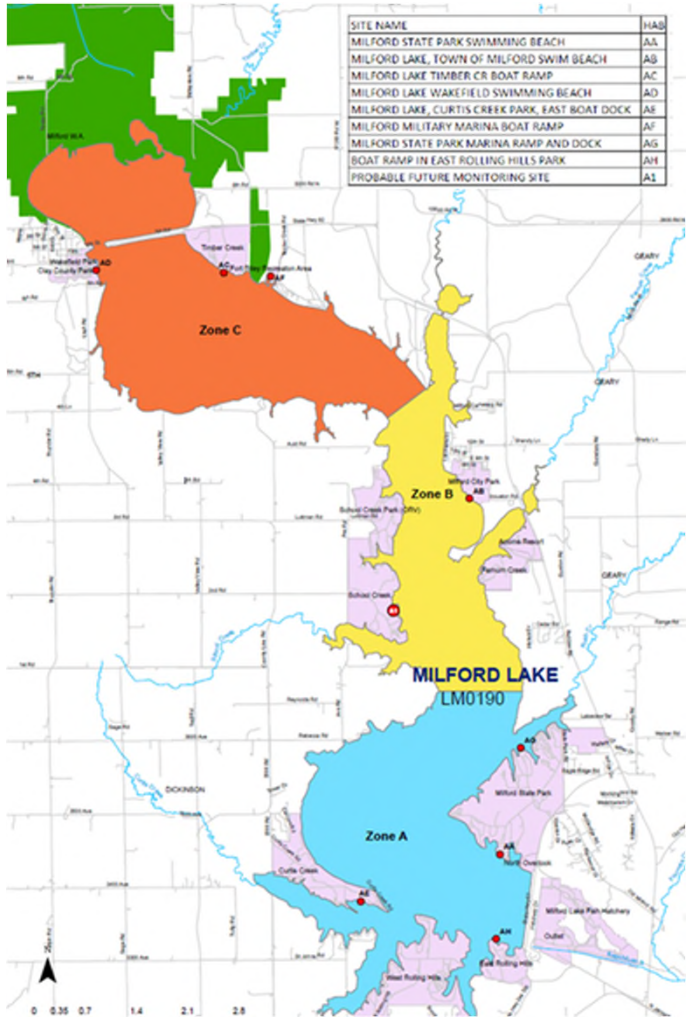




Kansas Harmful Algal Bloom Response Program

Kansas Program – Keys to Success

- Balance Resources
  - Evaluate Risk - Visitation and full body contact potential
  - Visual Advisories work for low risk sites
  - Focus priorities on high use/risk lakes; marina, resorts, residences, PWS intakes – use all tools
  - If Lake on advisory continues to look bad, skipping a sampling week may make sense – keep it posted
  - Toxins are easy to run; Cell counts not so much
  - Zoning of large lakes
- Adaptive Program Management
  - Keep making adjustments that make sense
  - Most plan adjustments add more flexibilities into the decision tree
  - Engage Stakeholders and the Public - Website Information



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Thank you. Questions?

Contacts:

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